Description

This invention relates in general to mechanisms for supporting a casing hanger in a wellhead and in particular to means for increasing the strength of the support.

In subsea wells, a wellhead is located on the sea floor. A first string of casing will be lowered through the wellhead and supported on the wellhead by means of a casing hanger located at the top of the casing string. Additional smaller diameter strings of casing may be subsequently installed on the first casing hanger. Various mechanisms have been used in the past for supporting the casing hangers in the wellhead. These include single load shoulders, expanding latch mechanisms, and high friction devices.

The simplest and most economical method is to use a single load shoulder. The load shoulder is a conical shoulder located in the bore of the wellhead housing. The diameter of the bore will be smaller below the load shoulder than above. The casing hanger has a downward facing load shoulder which lands on the load shoulder in the bore.

A single load shoulder, however, has limited load capacity. The inner diameters of the wellhead housing bore both above and below the load shoulder have fixed requirements that limit the radial or transverse dimensions of the load shoulder. Also, the yield strength of the wellhead housing is typically only around, 551.6 x 10^6Pa(80,000 psi). This type of load shoulder is capable of withstanding the stresses imposed upon it due to loadings on the wellheads up to 10,000 psi working pressures. The problem is to have a shoulder capable of withstanding stresses imposed from working pressures up to 103.4 x 10^6Pa (15,000 psi).

GB A-2193 599 discloses a surface casing assembly for use in surface well apparatus. The casing assembly comprises an annular casing head having an annular shoulder which directly or indirectly supports a tube provided with a tube hanger.

US-A-4 577 686 discloses a mudline support hanger assembly including the features of the preamble of claim 1.

The invention provides well assembly having a wellhead housing with a bore for receiving a casing hanger, an annular recess formed in the bore of the wellhead housing, having an upward facing shoulder with a transverse width, an insert member stationarily and rigidly mounted in the recess, the insert member having a lower surface engaging the recess shoulder, the insert member having a shoulder surface having a transverse width that is substantially less than the transverse width of the recess shoulder, the insert member being of a harder material than the material of the wellhead at the recess to provide greater supporting strength for the casing hanger, a downward facing shoulder formed on the exterior of the casing hanger a load ring having a lower end and an upper end and mounted to the casing hanger with the upper end in contact with the downward facing shoulder, the load ring having an upper cylindrical portion and a lower cylindrical portion of lesser diameter, defining a downward facing load shoulder that lands on the shoulder surface of the insert member characterized by: flow passage means between the load ring and the casing hanger for allowing cement returns.

Advantageous embodiments of the invention are claimed in the dependent claims.

The invention will now be described by way of example with reference to the accompanying drawings, wherein:

Figure 1 shows a frontal sectional view of a load supporting mechanism for a casing hanger in a wellhead constructed in accordance with this invention;

Figure 2 is a top view of an insert ring shown removed from the wellhead housing ;

Figure 3 is a cross-sectional view of the insert ring of Figure 2, taken along the line III-III ; and

Figure 4 is an alternate embodiment of a load supporting mechanism for a casing hanger in a wellhead.

Referring to Figure 1, wellhead housing 11 is of a type that would typically will be located on the subsea floor. It has a bore having an upper portion 13a and a lower portion 13b. The upper portion 13a is of larger inner diameter than the lower portion 13b. A shoulder 15 is located at the upper end of the bore lower portion 13b. Shoulder 15 is frusto-conical, facing upward and inward at an angle of about 30 degrees relative to horizontal.

A recess 17 is formed at the shoulder 15. The shoulder 15 forms the bottom of the recess 17. The recess 17 extends radially outward to a vertical wall 17a. The wall 17a has a diameter greater than the diameter of the bore upper portion 13a. Recess 17 has a downward facing upper shoulder or wall 17b that is perpendicular to the axis of the wellhead housing 11.

An insert ring 19 is rigidly and stationarily mounted inside the recess 17. The insert ring 19 has a lower side 21 that is a downward facing frusto-conical surface. The lower side 21 has the same dimensions as the recess shoulder 15 and mates with the recess shoulder 15. The insert ring 19 has an upper side 23 that is flat and perpendicular to the axis of the insert ring 19. The insert ring upper side 23 contacts the recess upper wall 17b. The insert ring 19 also has an outer diameter or wall that contacts the recess vertical wall 17a.

The insert ring 19 has an upper shoulder 25 that protrudes into the bore upper portion 13a. The upper shoulder 25 inclines at about a 30 degree angle relative to horizontal. Upper shoulder 25 is thus parallel to the shoulder 15.

The insert ring shoulder 25 has an inner diameter

that is the same as the inner diameter of the bore lower portion 13b. The outer diameter of the insert ring shoulder 25 is the same diameter as the bore upper portion 13a. Consequently, the transverse dimension, measured from the inner to the outer side is much less than the transverse dimension of the recess shoulder 15, measured from the inner diameter to the vertical wall 17a. Preferably, the radial or transverse dimension of the insert ring shoulder 25 is one-half that of the recess shoulder 15.

The insert ring 19 is of a material that is considerably harder than the material of the wellhead housing 11. The insert ring 19 is preferably of a steel material having a yield strength of 827.4 x 10^6Pa (120,000 psi),while the wellhead housing 11 is preferably of a steel material having a yield strength of 551.6x10^6Pa (80,000 psi).

Referring to Figures 2 and 3, the insert ring 19 is cut into three separate segments 19a, 19b and 19c. The segments 19a, 19b and 19c are formed by making three machined cuts 27a, 27b and 27c after the insert ring 19 is formed. The cuts 27a, 27b, 27c are located about 120 degrees apart. One of the cuts 27a is preferably cut along a radial line of the axis of the insert ring 19. The other two cuts 27b and 27c are cut parallel to the cut 27a. Consequently, the cuts 27b and 27c will not be on a radial line. This enables the segments 19a, 19b and 19c to be inserted piece by piece into the recess 17 (Fig. 1) without needing to flex any portions of the insert ring 19.

Before the cuts 27a, 27b and 27c are formed, a tapered hole 29 is drilled in the insert ring 19 in three places, 120 degrees apart. As shown in Figure 1, the tapered hole 29 extends vertically downward from the shoulder 25. The tapered hole 29 does not extend all the way to the lower side 21. The cuts 27a, 27b and 27c are cut through these tapered holes 29. This results in a tapered groove on each end of each segment 19a, 19b and 19c. The tapered grooves mate with each other to define the tapered holes 29. A dowel pin 31 is inserted into the tapered holes 29 after the ring 19 is assembled in the recess 17. This locks the segments 19a, 19b and 19c together when in the recess 17.

A casing hanger 33 is lowered into the wellhead housing 11 after the insert ring 19 is positioned in the recess 17. The casing hanger 33 has threads 35 on its lower end which will be secured to the upper end of a string of casing (not shown). A downward facing shoulder 36 is located on the exterior of the casing hanger 33.

The casing hanger 33 also includes a load ring 37, which is mounted to its exterior below the shoulder 36. Load ring 37 has an upper rim 39 positioned to contact the shoulder 36. Load ring 37 has an upper exterior portion 41 that is slightly less than the diameter of the bore upper portion 13a. Load ring 37 has a lower exterior portion 43 that is slightly less than the diameter of the lower bore portion 13b. A downward facing load shoulder 45 is formed at the junction of the upper and lower portions 41, 43. The load shoulder 45 is frusto-conical and has the same dimensions as the insert ring shoulder 25.

In the embodiment of Figure 1, the load ring 37 is secured to the casing hanger 33 by means of coarse threads 47. The threads 47 are triangular in configuration, each having an upward facing load flank 47a. These threads 47 screw onto threads 49 formed on the exterior of the casing hanger 33. Each thread 49 has a downward facing load flank 49a. Vertical slots (not shown) extend through the threads 47 so as to allow the upper portion of the load ring 37 to expand outward when loaded. The threads 47, 49 are cut so that prior to loading, a clearance will exist between the load flanks 47a, 49a. This clearance is shown in Figure 1.

A clearance also exists initially between the upper end 39 of the load ring 37 and the casing hanger shoulder 36. This clearance is greater than the clearance between the load flanks 47a, 49a. A protuberance 51 maintains this clearance until sufficient load is applied to close the clearances between the thread flanks 47a and 49a. This loads the threads 47,49. Then, further application of load will deform the protuberance 51 to close the clearance between the upper end 39 and the casing hanger shoulder 36. This assures that the threads 47, 49 will carry part of the load of the load ring 37, and not just the upper end 39.

A series of slots or channels 53 are cut along the exterior of the casing hanger 33. These slots 53 extend through the threads 49. This forms passages for the returns during cementing.

In operation, the insert ring 19 is inserted into the recess 17 before the wellhead housing 11 is lowered onto the sea floor and installed. This is handled by inserting first the segments 19a, 19b (Fig. 2), then the segment 19c. The parallel cuts 27b and 27c allow the insertion of the last segment 19c without having to flex any of the segments 19a, 19b or 19c. Then, dowel pins 31 are placed in the holes 29. The wellhead housing 11 is then lowered into place on the sea floor. Large diameter conductor pipe (not shown) will be attached to the lower end of the wellhead housing 11 and cemented into the well.

After the well is drilled deeper, a first string of casing is ran. The casing hanger 33 will be secured to the upper end of the string of casing which is being lowered into the well. The casing hanger 33 will have the load ring 37 secured to it at the surface. When the casing hanger 33 moves down into the wellhead housing 11, the load ring 37 will contact the insert ring shoulder 25. The weight of the casing will be transmitted through the load ring 37 to the insert ring 19, and to the wellhead housing 11.

The protuberance 51 will begin to deform under the load. First, the clearances between the load

flanks 47a, 49a will close up, these being smaller than the clearance between the upper end 39 of the load ring 37 and the casing hanger shoulder 36. When the clearances between the threads 47, 49 have closed, the deformation of protuberance 51 continues until the clearance between the upper end 39 and the shoulder 36 closes.

The insert shoulder 25 transmits all of the weight to the recess shoulder 15. The recess shoulder 15 has a radial dimension that is twice as large as the insert shoulder 25. This larger surface area enables the recess shoulder 15 to withstand substantially the same load as the insert shoulder 25, even though the yield strength of the insert shoulder 25 is greater than the yield strength of the recess shoulder 15. Cement will be then pumped down a drill string through the casing hanger 33 to return up the annular space around the casing. Returns from the cement will flow up the passages 53.

In the embodiment of Figure 4, features which are the same as the first embodiment will not be discussed. In this embodiment, the difference is that the load ring 37' is not secured by any threads such as shown in Figure 1. Rather, the load ring 37' is press fitted onto the exterior of the casing hanger 33'. Rather than slots 53 formed on the exterior of the casing hanger 33 as in Figure 1, holes 55 are drilled through the load ring 37'. Mating holes 57 are drilled through the casing hanger 33'. The holes 57 extend from the shoulder 36' to the exterior above the casing hanger 33'. The passages 55, 57 serve as cement return passages.

The invention has significant advantages. The insert ring strengthens the single load shoulder in the wellhead housing, enabling it to withstand greater pressures or load. The insert ring has no moving parts, reducing any chance for malfunctioning to occur. The clearances and the protuberance on the load ring assure that the threads will load first, and not just the upper shoulder of the load ring.

The passages of the second embodiment provide better cross-sectional areas to avoid clogging of particles of the returns from cementing. Bearing capacity of the load ring of the alternate embodiment is maximized because of the continuity and surface contact between the casing hanger and wellhead housing. The structural integrity of the load ring is maximized in the alternate embodiment due to the distributed bridging of material between the flow passage holes.

Claims

1. A well assembly having a wellhead housing (11) with a bore (13a, 13b) for receiving a casing hanger (33), an annular recess (17) formed in the bore (13a, 13b) of the wellhead housing (11), having an upward facing shoulder (15) with a transverse width, an insert member (19) stationarily and rigidly mounted in the recess (17), the insert member (19) having a lower surface (21) engaging the recess shoulder (15), the insert member having a shoulder surface (25) having a transverse width that is substantially less than the transverse width of the recess shoulder (15), the insert member (19) being of a harder material than the material of the wellhead (11) at the recess (17) to provide greater supporting strength for the casing hanger (33), a downward facing shoulder (36) formed on the exterior of the casing hanger (33), a load ring (37) having a lower end and an upper end and mounted to the casing hanger (33) with the upper end in contact with the downward facing shoulder (36), the load ring (37) having an upper cylindrical portion (41) and a lower cylindrical portion (43) of lesser diameter, defining a downward facing load shoulder (45) that lands on the shoulder surface (25) of the insert member (19), characterized by:

   flow passage means (53 or 55, 57) between the load ring (37) and the casing hanger (33) for allowing cement returns.

2. The well assembly according to claim 1 wherein the flow passage means comprises:

   a plurality of channels (53) formed along the exterior of the casing hanger (33) and through the shoulder (36) and along an inner diameter of the load ring (37).

3. The well assembly according to claim 1 wherein the flow passage means comprises:

   a plurality of passages (57) extending from below the downward facing shoulder (36) to the exterior of the casing hanger (33') above the downward facing shoulder (36'); and

   a plurality of passages (55) extending through load ring (37') from a lower end to an upper end and communicating with the passages (57) in the casing hanger (33').

4. The well assembly according to claim 2 and 3 wherein:

   the shoulder (15) in the recess (17) is frusto-conical; and

   the lower surface (21) of the insert member (19) is frusto-conical.

5. The well assembly according to claim 2 or 3 wherein:

   the insert member 19 has three transverse cuts (27a, 27b, 27c) defining three separate segments (19a, 19b, 19c) so as to allow the insert member (19) to be installed in the recess (17) without flexing, at least two of the cuts (27b, 27c) being parallel with each other.

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flanks 47a, 49a will close up, these being smaller than the clearance between the upper end 39 of the load ring 37 and the casing hanger shoulder 36. When the clearances between the threads 47, 49 have closed, the deformation of protuberance 51 continues until the clearance between the upper end 39 and the shoulder 36 closes.

The insert shoulder 25 transmits all of the weight to the recess shoulder 15. The recess shoulder 15 has a radial dimension that is twice as large as the insert shoulder 25. This larger surface area enables the recess shoulder 15 to withstand substantially the same load as the insert shoulder 25, even though the yield strength of the insert shoulder 25 is greater than the yield strength of the recess shoulder 15. Cement will be then pumped down a drill string through the casing hanger 33 to return up the annular space around the casing. Returns from the cement will flow up the passages 53.

In the embodiment of Figure 4, features which are the same as the first embodiment will not be discussed. In this embodiment, the difference is that the load ring 37' is not secured by any threads such as shown in Figure 1. Rather, the load ring 37' is press fitted onto the exterior of the casing hanger 33'. Rather than slots 53 formed on the exterior of the casing hanger 33 as in Figure 1, holes 55 are drilled through the load ring 37'. Mating holes 57 are drilled through the casing hanger 33'. The holes 57 extend from the shoulder 36' to the exterior above the casing hanger 33'. The passages 55, 57 serve as cement return passages.

The invention has significant advantages. The insert ring strengthens the single load shoulder in the wellhead housing, enabling it to withstand greater pressures or load. The insert ring has no moving parts, reducing any chance for malfunctioning to occur. The clearances and the protuberance on the load ring assure that the threads will load first, and not just the upper shoulder of the load ring.

The passages of the second embodiment provide better cross-sectional areas to avoid clogging of particles of the returns from cementing. Bearing capacity of the load ring of the alternate embodiment is maximized because of the continuity and surface contact between the casing hanger and wellhead housing. The structural integrity of the load ring is maximized in the alternate embodiment due to the distributed bridging of material between the flow passage holes.

Claims

1. A well assembly having a wellhead housing (11) with a bore (13a, 13b) for receiving a casing hanger (33), an annular recess (17) formed in the bore (13a, 13b) of the wellhead housing (11), having an upward facing shoulder (15) with a transverse width, an insert member (19) stationarily and rigidly mounted in the recess (17), the insert member (19) having a lower surface (21) engaging the recess shoulder (15), the insert member having a shoulder surface (25) having a transverse width that is substantially less than the transverse width of the recess shoulder (15), the insert member (19) being of a harder material than the material of the wellhead (11) at the recess (17) to provide greater supporting strength for the casing hanger (33), a downward facing shoulder (36) formed on the exterior of the casing hanger (33), a load ring (37) having a lower end and an upper end and mounted to the casing hanger (33) with the upper end in contact with the downward facing shoulder (36), the load ring (37) having an upper cylindrical portion (41) and a lower cylindrical portion (43) of lesser diameter, defining a downward facing load shoulder (45) that lands on the shoulder surface (25) of the insert member (19), characterized by:

   flow passage means (53 or 55, 57) between the load ring (37) and the casing hanger (33) for allowing cement returns.

2. The well assembly according to claim 1 wherein the flow passage means comprises:

   a plurality of channels (53) formed along the exterior of the casing hanger (33) and through the shoulder (36) and along an inner diameter of the load ring (37).

3. The well assembly according to claim 1 wherein the flow passage means comprises:

   a plurality of passages (57) extending from below the downward facing shoulder (36) to the exterior of the casing hanger (33') above the downward facing shoulder (36'); and

   a plurality of passages (55) extending through load ring (37') from a lower end to an upper end and communicating with the passages (57) in the casing hanger (33').

4. The well assembly according to claim 2 and 3 wherein:

   the shoulder (15) in the recess (17) is frusto-conical; and

   the lower surface (21) of the insert member (19) is frusto-conical.

5. The well assembly according to claim 2 or 3 wherein:

   the insert member 19 has three transverse cuts (27a, 27b, 27c) defining three separate segments (19a, 19b, 19c) so as to allow the insert member (19) to be installed in the recess (17) without flexing, at least two of the cuts (27b, 27c) being parallel with each other.

6. The well assembly according to claim 5 further comprising:
a slot extending downward from the shoulder surface (25) on each end of each segment (19a, 19b, 19c), defining a downward extending cavity (29) at each cut (27a, 27b, 27c); and
a dowel pin (31) inserted into each cavity (29) to hold the segments within the recess.

Patentansprüche

1. Bohrlochvorrichtung mit einem Bohrlochkopfgehäuse (11) mit einer Bohrung (13a, 13b) zum Aufnehmen eines Futterrohraufhängers (33), einer ringförmigen Ausnehmung (17), die in der Bohrung (13a, 13b) des Bohrlochkopfgehäuses (11) gebildet ist und eine nach oben gewandte Schulter (15) mit einer Querbreite hat, einem Einsatzteil (19), das in der Ausnehmung (17) stationär und starr befestigt ist, wobei das Einsatzteil (19) eine untere Oberfläche (21) hat, die die Ausnehmungsschulter (15) berührt, wobei das Einsatzteil eine Schulterfläche (25) hat, die eine Querbreite hat, welche wesentlich kleiner als die Querbreite der Ausnehmungsschulter (15) ist, wobei das Einsatzteil (19) aus einem härteren Material als das Material des Bohrlochkopfes (11) an der Ausnehmung (17) besteht, um eine größere Tragfestigkeit für den Futterrohraufhänger (33) bereitzustellen, einer nach unten gewandten Schulter (36), die auf der Außenseite des Futterrohraufhängers (33) gebildet ist, einem Lastring (37), der ein unteres Ende und ein oberes Ende hat und an dem Futterrohraufhänger (33) befestigt ist, wobei das obere Ende in Kontakt mit der nach unten gewandten Schulter (36) ist, wobei der Lastring (37) einen oberen zylindrischen Teil (41) und einen unteren zylindrischen Teil (43) kleineren Durchmessers hat, der eine nach unten gewandte Lastschulter (45) bildet, die auf der Schulterfläche (25) des Einsatzteils (19) zu liegen kommt, gekennzeichnet durch:
eine Strömungsdurchlaßeinrichtung (53 oder 55, 57) zwischen dem Lastring (37) und dem Futterrohraufhänger (33) zum Gestatten von Zementrückflüssen.

2. Bohrlochvorrichtung nach Anspruch 1, wobei die Strömungsdurchlaßeinrichtung aufweist:
eine Vielzahl von Kanälen (53), die längs der Außenseite des Futterrohraufhängers (33) und durch die Schulter (36) sowie längs eines inneren Umfangs des Lastringes (37) gebildet sind.

3. Bohrlochvorrichtung nach Anspruch 1, wobei die Strömungsdurchlaßeinrichtung aufweist:
eine Vielzahl von Durchlässen (57), die sich von unterhalb der nach unten gewandten Schulter (36) zu der Außenseite des Futterrohraufhängers (33') über der nach unten gewandten Schulter (36') erstrecken;
eine Vielzahl von Durchlässen (55), die sich durch den Lastring (37') von einem unteren Ende zu einem oberen Ende erstrecken und mit den Durchlässen (57) in dem Futterrohraufhänger (33') in Verbindung stehen.

4. Bohrlochvorrichtung nach den Ansprüchen 2 und 3, wobei:
die Schulter (15) in der Ausnehmung (17) kegelstumpfförmig ist; und
die untere Oberfläche (21) des Einsatzteils (19) kegelstumpfförmig ist.

5. Bohrlochvorrichtung nach Anspruch 2 oder 3, wobei:
das Einsatzteil (19) drei quer angeordnete Schnitte (27a, 27b, 27c) hat, welche drei separate Segmente (19a, 19b, 19c) bilden, so daß es möglich ist, das Einsatzteil (19) in der Ausnehmung (17) ohne Biegen zu installieren, wobei wenigstens zwei der Schnitte (27b, 27c) parallel zueinander sind.

6. Bohrlochvorrichtung nach Anspruch 5, weiter mit:
einem Schlitz, der sich von der Schulterfläche (25) an jedem Ende jedes Segments (19a, 19b 19c) aus nach unten erstreckt und einen sich nach unten erstreckenden Hohlraum (29) an jedem Schnitt (27a, 27b, 27c) bildet;
einem Paßstift (31), der in jeden Hohlraum (29) eingeführt ist, um die Segmente in der Ausnehmung zu halten.

Revendications

1. Un ensemble pour puits de pétrole comprenant une cage de tête de puits (11) comportant un alésage (13a, 13b) pour recevoir un dispositif de suspension de cuvelage (33), un évidement annulaire (17) formé dans l'alésage (13a, 13b) de la cage de tête de puits (11) ayant un épaulement dirigé vers le haut (15) avec une largeur transversale, un élément rapporté (19) immobile monté de manière rigide dans l'évidement (17), ledit élément rapporté (19) ayant une face inférieure (21) qui s'engage sur l'épaulement 15 de l'évidement (17), ledit élément rapporté (19) comportant une face d'épaulement (25) ayant une largeur transversale substantiellement inférieure à la largeur transversale de l'épaulement (15) de l'évidement (17), l'élément rapporté (19) étant fabriqué dans un métal plus dur que le métal de la cage de tête

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de puits (11) au niveau de l'évidement (17) pour donner une résistance plus grande au dispositif de suspension de cuvelage (33), un épaulement dirigé vers le bas (36) formé sur la paroi extérieure du dispositif de suspension de cuvelage (33), une couronne de charge (37) comprenant une extrémité inférieure et une extrémité supérieure et étant montée sur le dispositif de suspension de cuvelage (33) avec son extrémité supérieure en contact avec l'épaulement dirigé vers le bas (36), la couronne de charge (37) ayant une partie cylindrique supérieure (41) et une partie cylindrique inférieure (43) de plus petit diamètre et définissant un épaulement de charge dirigé vers le bas (45) qui repose sur la face d'épaulement (25) de l'élément rapporté (19), caractérisé par le fait qu'il comprend :

un moyen à conduits de retour (53 ou 55, 57) entre la couronne de charge (37) et le dispositif de suspension de cuvelage (33) utilisé pour les retours de ciment.

2. Un ensemble pour puits de pétrole selon la revendication 1 dans lequel le moyen à conduits de retour comprend:-

une pluralité de canaux (53) formés le long de la paroi extérieure du dispositif de suspension de cuvelage (33) et au travers de l'épaulement (36) et le long du diamètre intérieur de la couronne de charge (37).

3. Un ensemble pour puits de pétrole selon la revendication 1 dans lequel le moyen à conduits de retour comprend:-

une pluralité de conduits (57) s'étendant entre l'épaulement dirigé vers le bas (36) et la paroi extérieure du dispositif de suspension de cuvelage (33') au-dessus de l'épaulement dirigé vers le bas (36'); et

une pluralité de conduits (55) s'étendant au travers de la couronne de charge (37') entre une extrémité inférieure et une extrémité supérieure et communiquant avec les conduits (57) à l'intérieur du dispositif de suspension de cuvelage (33').

4. Un ensemble pour puits de pétrole selon la revendication 2 et la revendication 3 dans lequel:-

l'épaulement (15) dans l'évidement (17) est tronconique; et

la face inférieure (21) de l'élément rapporté (19) est tronconique.

5. Un ensemble pour puits de pétrole selon la revendication 2 ou la revendication 3 dans lequel:-

l'élément rapporté (19) a trois coupures transversales (27a, 27b, 27c) définissant trois segments séparés (19a, 19b, 19c) de façon à pouvoir installer l'élément rapporté (19) dans l'évidement (17) sans avoir à le courber, au moins deux desdites coupures (27b, 27c) étant parallèles l'une par rapport à l'autre.

6. Un ensemble pour puits de pétrole selon la revendication 5 comprenant en outre:-

une rainure dirigée vers le bas à partir de la face d'épaulement (25) à chaque extrémité de chacun des segments (19a, 19b, 19c) , définissant un évidement s'étendant vers le bas situé à chaque coupure (27a, 27b, 27c); et

une goupille conique (31) insérée dans chaque entaille (29) pour maintenir les segments à l'intérieur de l'évidement.